

**Arthur D Little**

**Fuel Cell Development  
Programs**

**Precious Metal Availability and Cost  
Analysis for PEMFC Commercialization**

**October 30, 2001  
Contractor Coordination  
Meeting**

**USDOE OTT  
Washington, D.C.**

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**Platinum group metals (PGMs) are critical to the commercialization of fuel cells.**

- Support critical levels of performance (power density and efficiency)
- In the stack, primarily platinum and some ruthenium essential to catalysis of anodic and cathodic reactions
  - alloys offer potential to increase activity while reducing platinum loading
- In the fuel processor, important for catalysis of reforming and shift reactions
- Fuel cell stack dominates the demand

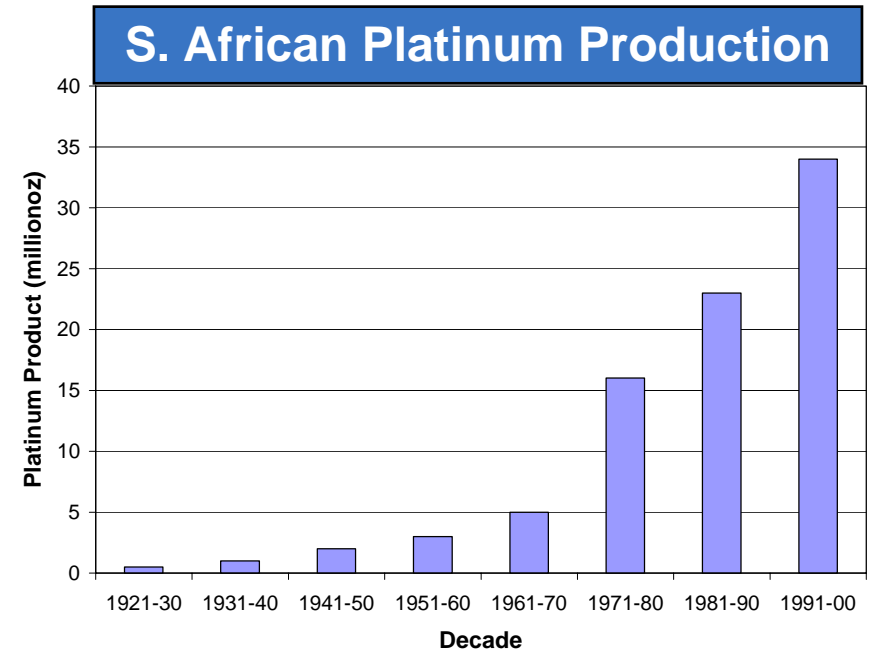
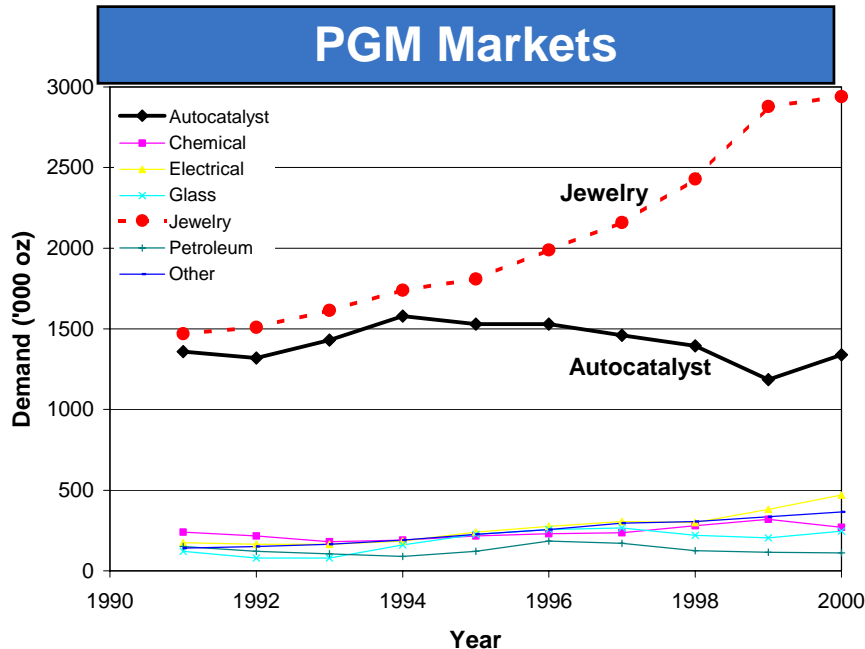
**However, PGMs also represent a significant contribution to the overall system cost.**

**Successful adoption of fuel cells in transportation applications in the long-term could lead to significant pressure on PGM prices and supply.**

- Can long-term reserves accommodate the new demand from fuel cell markets (transportation, stationary, and portable)?
- How will mining and refining operations respond to increases in market demand?
  - Uncertainty in market development
  - Different market development scenarios
- What role will recycling play in the supply chain as fuel cell markets develop?
  - Supply
  - Residual value of fuel cell at end-of-life
  - Market price of platinum
- Relationship of supply, demand, and price of PGMs as fuel cell markets develop?

## Factors Influencing PGM Supply and Demand

**Fuel cell PGM demand will dominate PGM markets leading to the need for increased production.**



**Fuel Cell PGM Demand**

Pt loading (mg/cm<sup>2</sup>), Power Density, Power Plant Size, Number of Vehicles

**In Year 2000, South Africa produced approximately 75% of the platinum worldwide.**

## PGM Project Objectives

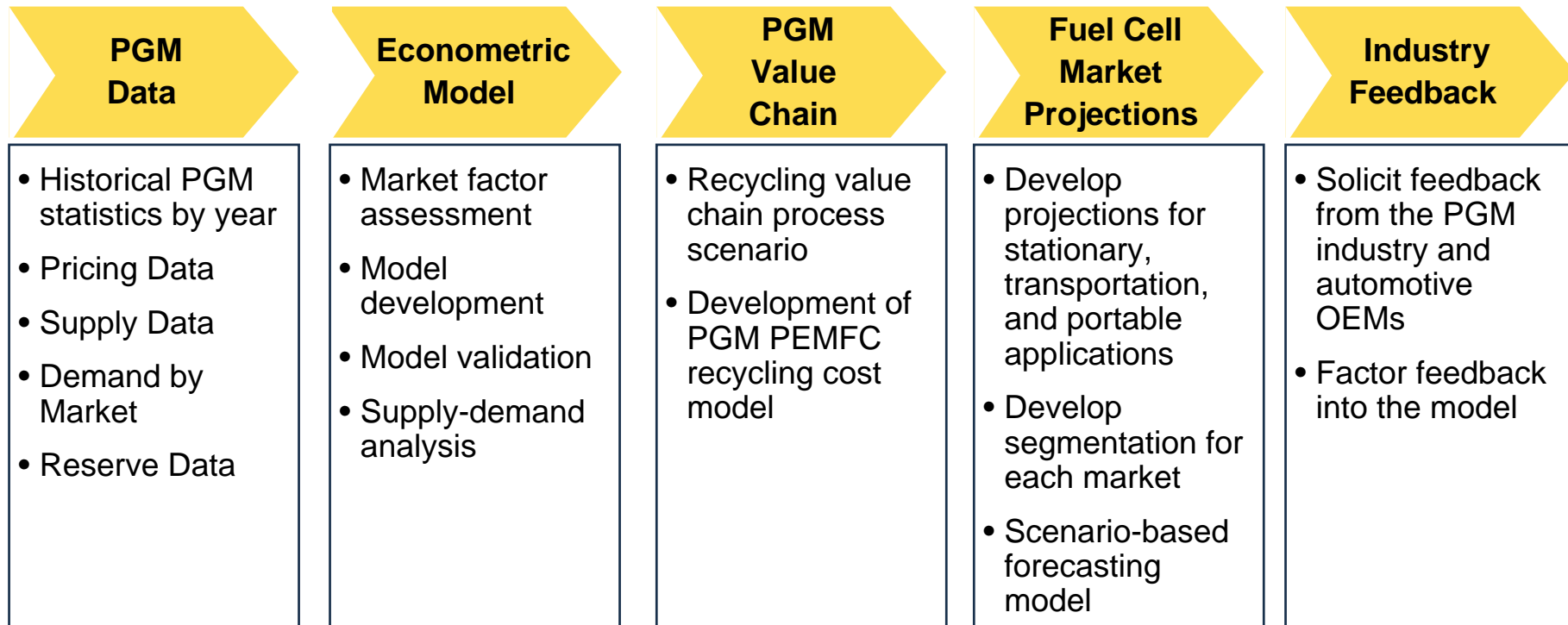
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- To assess current and projected demand for PGMs exclusive of fuel cell applications
- To estimate the temporal and price relationships between supply capacity/reserves and long-term growth in demand for PGMs
- To develop an econometric model to estimate the impact of fuel cell market growth scenarios on PGM supply and pricing
- To perform a sensitivity analysis on supply and pricing to critical parameters in the model related to fuel cell markets and technology advances
- To obtain critical feedback from the important participants in the PGM value chain on the model assumptions and projections
- To develop cost projections for the economics of recycling of PGMs from fuel cells and the impact on PGM supply and price

## PGM Study Scope

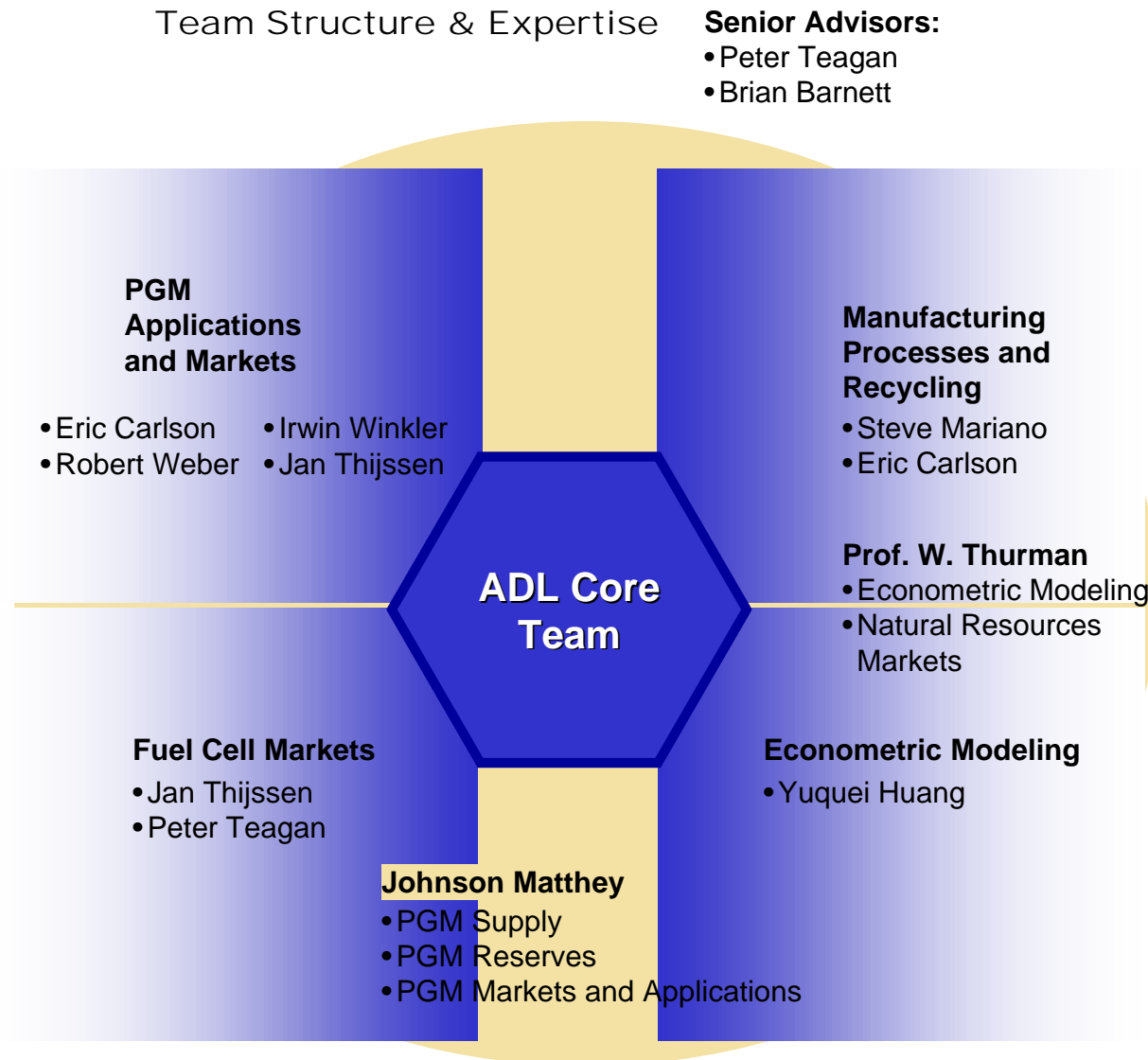
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**We will use the econometric model to identify critical parameters influencing PGM cost as a function of supply and demand.**



**The model will allow us to test the sensitivity of supply and pricing to various market development scenarios.**

# Team Structure



Schedule

Project schedule from award date:

